

I claim:

1. A cable for an endoscope viewing apparatus for viewing an objective, the cable comprising:
an image viewing cable end portion for association with an image viewing means for viewing
an image of the objective;

5 a distal image forming cable end portion including image forming means for forming an
image of the objective, said image forming cable end portion having an image forming cable end
portion axis;

image transmission means for transmitting an image from said image forming means to said
image viewing end portion;

illumination light conducting fibers for conducting illumination light from said image
viewing cable end portion to said image forming cable end portion to illuminate a viewing objective,
said illumination light conducting fibers having an image forming end portion with an image forming
end portion axes; and,

a first of said illumination light conducting fiber image forming end portion axes is in a first
angular relation to said image forming cable end portion axis; and,

a second of said illumination light conducting fiber image forming end portion axes is in a
second angular relation to said image forming cable end portion axis.

2. A cable as in claim 1, further comprising:

said first illumination light conducting fiber image forming end portion axis lies in a common
20 plane with said image forming cable end portion axis.

3. A cable as in claim 1, further comprising:

said image transmission means includes a fiber-optic image bundle having a central image

bundle axis, said image bundle axis generally coinciding with a cable axis including said image forming cable end portion axis.

4. An endoscope cable for use in an endoscope viewing apparatus for viewing an objective, the cable comprising:

an image viewing cable end portion for association with an image viewing means for viewing an image of the objective;

a distal, image forming cable end portion including image forming means for forming an image of the objective, said image forming cable end portion having an image forming cable end portion axis;

image transmission means for transmitting an image from said image forming means to said image viewing cable end portion;

a plurality of illumination light conducting fibers extending from an illumination light receiving end proximate said image viewing cable end portion to an illumination light emitting end proximate said image forming cable end portion, each of said illumination light conducting fibers having an illumination light conducting fiber axis including an illumination light conducting fiber axis light emitting end portion adjacent said illumination light emitting end; and,

a first of said illumination light conducting fibers has an illumination light conducting fiber axis including a first illumination light conducting fiber axis light emitting end portion and, said first illumination light conducting fiber axis light emitting end portion lies generally in a common plane with and at a first acute angle to said image forming cable end portion axis.

5. An endoscope cable as in claim 4, further comprising:

said first acute angle is generally 10 degrees.

6. An endoscope cable as in claim 4, further comprising:

said first acute angle is generally 20 degrees.

7. An endoscope cable as in claim 4, further comprising:

a second of said illumination light conducting fibers has an illumination light conducting fiber axis including a second illumination light conducting fiber axis light emitting end portion and, said second illumination light conducting fiber axis light emitting end portion lies generally in a common plane with and at a second acute angle to said image forming cable end portion axis.

8. An endoscope cable as in claim 7, further comprising:

said first acute angle is generally 10 degrees; and,

said second acute angle is generally 20 degrees.

9. The endoscope cable of claim 4, further comprising:

a central optical fiber image bundle having a central image bundle axis and extending from said distal cable end portion proximate said image forming means to said image viewing cable end portion, said central image bundle axis generally coinciding with an endoscope cable axis including said image forming cable end portion axis.

10. In an endoscope cable for use with an endoscope viewing apparatus, the cable including a distal image forming end, a central optical fiber image bundle with an image bundle axis including a distal image bundle axis end portion proximate the image forming end, and illumination light conducting optical fibers lying generally adjacent to the optical fiber image bundle, extending to distal light emitting end faces proximate the image forming end and having central axes including an illumination light conducting optical fiber axis distal end portion proximate the light emitting

face, the improvement comprising:

a first illumination light conducting optical fiber axis distal end portion lies in a common plane with and forms a first acute angle with the image bundle axis distal end portion.

11. The improvement of claim 9, further comprising:

said first acute angle is generally 10 degrees.

12. The improvement of claim 9, further comprising:

said first acute angle is generally 20 degrees.

13. The improvement of claim 10, further comprising:

a second distal illumination light conducting optical fiber axis end portion lies in a common plane with and forms a second acute angle with the image bundle axis distal end portion.

14. The improvement of claim 13, further comprising:

said first acute angle is generally 10 degrees and said second acute angle is generally 20 degrees.

15. The improvement of claim 13, further comprising:

a first illumination light conducting optical fiber end face is generally normal to said first illumination light conducting optical fiber axis distal end portion; and,

a second illumination light conducting optical fiber end face is generally normal to said second illumination light conducting optical fiber axis distal end portion.

16. The improvement of claim 15, further comprising:

said first acute angle is generally 10 degrees and said second acute angle is generally 20 degrees.

17. A cable for an endoscope viewing apparatus as in claim 4, further comprising:

an end cap, said end cap enclosing said distal image forming cable end portion, said end cap including an end face having a planar end face surface with a circular inner edge defining a view port and a circular outer edge, a first conical surface having a circular first conical surface inner edge joined rigidly and continuously to said end face outer edge and a circular first conical surface outer edge, said first conical surface further having a circular first conical surface interior edge defining a first illumination light conducting fiber port adapted to receive said light emitting end portion of said first of said illumination light conducting fibers, said first conical surface relieved from the plane of said planar end surface at an angle equal to said first acute angle such that said first illumination light conducting fiber axis light emitting end portion is normal to said first conical surface.

18. A cable for an endoscope viewing apparatus as in claim 7, further comprising:

an end cap, said end cap enclosing said distal image forming cable end portion, said end cap including an end face having a planar end face surface with a circular inner edge defining a view port and a circular outer edge, a first conical surface having a circular first conical surface inner edge joined rigidly and continuously to said end face outer edge and a circular first conical surface outer edge, said first conical surface further having a circular first conical surface interior edge defining a first illumination light conducting fiber port adapted to receive said light emitting end portion of said first of said illumination light conducting fibers, said first conical surface relieved from the plane of said planar end surface at an angle equal to said first acute angle such that said first illumination light conducting fiber axis light emitting end portion is normal to said first conical surface, a second conical surface having a circular second conical surface inner edge joined rigidly and continuously to said first conical surface outer edge and a second conical surface outer edge, said

second conical surface further having a circular second conical surface interior edge defining a second illumination light conducting fiber port adapted to receive said light emitting end portion of said second of said illumination light conducting fibers, said second conical surface relieved from the plane of said planar end surface at an angle equal to said second acute angle such that said second illumination light conducting fiber axis light emitting end portion is normal to said second conical surface.

19. A cable for an endoscope viewing apparatus as in claim 18, further comprising:

a cylindrical surface having a circular first cylindrical surface edge and a second surface edge, said first cylindrical surface edge joined rigidly and continuously to said second conical surface outer edge.

20. A cable for an endoscope viewing apparatus as in claim 19, further comprising:

said first acute angle is generally 10 degrees; and,
said second acute angle is generally 20 degrees.